

REMARKS

This application has been reviewed in light of the Office Action mailed July 2, 2003. Claims 1, 8, 24-26 and 42 have been amended without adding new matter. Claims 9 and 47 have been cancelled. Applicants reserve the right to pursue the original claims and other claims in this application and in other applications.

Claims 1-9, 14-39, 42-44 and 47-49 stand rejected under 35 U.S.C. 102 as being anticipated by Chen et al., Publication No. US 2003/0042621 (hereinafter "Chen"). Reconsideration is respectfully requested.

Claim 1 of the present invention recites a "wire bonded structure comprising: ... a first wire bond between said first and said second bonding areas; [and] a second wire bond between said second and said third bonding areas." Claim 1 has been amended to recite that a "bump is at one end of each of said first and second wire bonds." This feature of the invention is illustrated, for example, in Figure 5B and accompanying text of the specification, which show and describe bumps 50 and 56 at one end of wire bonds 54 and 60, respectively. The invention is not limited to the preferred embodiments.

Chen fails to teach or suggest this limitation. In Figure 4, relied upon by the Office Action, Chen discloses a bump 132 at one end of a wire bond (not numbered), but no bump at an end of the second wire bond 134. Thus, Chen fails to teach or suggest a "bump ... at one end of each of said first and second wire bonds."

To anticipate claim 1, Chen must teach each and every limitation of claim 1. In this case, Chen does not. For at least this reason, claim 1 is allowable over Chen. Claims 2-8 depend from claim 1 and contain every limitation of claim 1, and should be allowed together with claim 1. (Claim 9 has been cancelled.)

Claim 14 recites a "wire bonded structure comprising: ... a first wire bond [and] ... a second wire bond ... wherein said first wire bond and said second wire bond are configured such that an imaginary line drawn between endpoints of said first wire bond and an imaginary line drawn between endpoints of said second wire bond are not parallel."

This feature of the invention is illustrated, for example, in Figures 5B, 6 and 8, and described in the accompanying text in the specification.

Chen fails to teach or suggest this limitation. The Office Action asserts that Chen discloses a “bond at an angle (figure 4) which may comprise daisy chain (paragraph 2).” Office Action, page 2. Paragraph 2 of Chen, however, is part of the “Background of the Invention” section that discusses a different reference, and nothing in Figure 4 of Chen anticipates the above quoted limitations of claim 14.

For at least these reasons, claim 14 is allowable. Claims 15-17 depend from claim 14 and contain every limitation of claim 14. Claims 15-17 are allowable for at least the same reasons as for allowance of claim 14, and also because the unique combinations recited by these dependent claims are neither taught nor suggested by Chen. For example, claim 15 recites that an “intersection between said imaginary lines forms an angle in a horizontal plane.” This is another reason why claim 15 is allowable.

Claim 18 recites a “wire bonded structure comprising: a first conductive bump on a first bonding surface; [and] ... a first wire bond extending from said ... conductive bump; [and] a second conductive bump on a third bonding surface; [and] ... a second wire bond between [a] second ball bond and said second conductive bump.” As discussed above with respect to claim 1, Chen fails to teach or suggest the claimed structure having a first and a second bump, and claim 18 is allowable for at least this reason. Claims 19-23 depend from claim 18 and should be allowed together with claim 18.

Claim 24 relates to a method for wire bonding. Claim 24 has been amended to recite “forming a first wire bond between first and second components; [by] ... connecting said first wire bond on at least one end using a ball bond on top of a first conductive bump.” Chen fails to teach or suggest this limitation because it shows only that a stitch-type bond 130 is formed on top of its bump 132. Paragraph 71; Figure 4. For at least this reason, amended claim 24 is allowable over Chen. Claims 25-33 depend from claim 24 and contain every limitation of claim 24. Claims 25-33 should be allowed for at least the

same reasons, and also because the unique combinations recited in these dependent claims are not anticipated by Chen.

Claim 34 recites a method for wire bonding comprising “forming a first conductive bump on a first surface; [and] ... forming a first wire bond ... to said first conductive bump; forming a second conductive bump on a third surface; [and] ... forming a second wire bond ... to said second conductive bump.” As discussed above with respect to claims 1 and 18, Chen fails to teach or suggest this limitation, and claim 34 is allowable for at least this reason. Claims 35-39 depend from claim 34 and contain every limitation of claim 34, and should be allowed together with their base claim.

Claim 42 recites an apparatus for making wire bond connections. Claim 42 has been amended to recite that the apparatus “forms a first wire bond from a first surface to a second surface, and forms a second wire bond from said second surface to a third surface ... , and wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane.” As discussed above with respect to claims 14 and 15, Chen fails to teach or suggest this limitation and claim 42 is thus allowable over Chen. Claims 43, 44, 48 and 49 depend from claim 42 and should be allowed together with claim 42. (Claim 47 has been cancelled.)

Claims 1, 5, 6, 10-17 and 42-57 stand rejected under 35 U.S.C. 102 as being anticipated by Fujishima, U.S. Patent No. 6,148,505 (hereinafter “Fujishima”). This rejection is traversed for the following reasons.

As discussed above, claim 1 of the present invention has been amended to recite a “wire bonded structure comprising: ... a first wire bond [and] ... a second wire bond ... , wherein a bump is at one end of each of said first and second wire bonds.” Fujishima does not teach or suggest the presence of bumps on its bond pads AP, BP or 40. For this reason alone claim 1 is allowable over Fujishima. Claims 5, 6 and 10-13 depend from claim 1 and should be allowed for the same reasons as for their base claim, and for other reasons.

Claim 14 recites a “wire bonded structure comprising: a substrate, a lower chip positioned over said substrate, and an upper chip positioned over said lower chip, each of

said substrate, lower chip and upper chip having exposed bonding pads.” Fujishima fails to teach or suggest a wire bonded structure having the claimed arrangement, and the Office Action does not assert to the contrary. For at least this reason claim 14 is allowable, and claims 15-17, which depend from claim 14, are also allowable. Claims 15-17 also recite limitations which are not taught or suggested by Fujishima. For example, claim 17 recites that an “intersection between said imaginary lines [between the endpoints of the wire bonds] forms an angle in horizontal and vertical planes.” This is an additional reason why claim 17 should be allowed.

Claim 42 recites an “device for feeding a wire, said device adapted to form ball bonds and wire bonds.” Fujishima fails to teach or suggest a device adapted to form ball bonds, and for at least this reason claim 42 is allowable over Fujishima. Claims 43-49 depend from claim 42 and should be allowed for the same reasons as for allowance of claim 42, and for other reaons.

Claim 50 recites a wire bonding apparatus comprising a controller for controlling a wire bonding device. According to claim 50, the “device forms a first conductive bump on a first conductive surface, a first ball bond on a second conductive surface, a first wire bond from said first ball bond to said first conductive bump, a second conductive bump on a third surface, a second ball bond on said second conductive surface, and a second wire bond from said second ball bond to said second conductive bump.” None of these limitations are taught or suggested by Fujishima, nor does the Office Action explain to the contrary. For at least these reasons, claim 50 and claims 51-57 dependent therefrom are allowable over Fujishima.

Claims 42-57 stand rejected under 35 U.S.C. 102 as being anticipated by Nagaoka et al., U.S. Patent No. 5,292,050 (hereinafter “Nagaoka”). Reconsideration is respectfully requested.

Claim 42 recites an apparatus comprising a “device … [that] forms a first wire bond from a first surface to a second surface, and forms a second wire bond from said second surface to a third surface, wherein said first and second wire bonds are electrically

connected on said second surface, and wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane.” Nagaoka fails to teach or suggest this claim limitation. Nagaoka relates to determining the angle and distance of a wire bond between two points. Column 5, line 9 to column 6, line 18. Nagaoka does not teach or suggest a device for forming two wire bonds, which are formed at an angle in a horizontal plane, as claimed in claim 42. For at least this reason claim 42 and claims 43-49 dependent therefrom are not anticipated by Nagaoka, and should therefore be allowed.

Claim 50 recites a “device [that] forms a first conductive bump on a first conductive surface, a first ball bond on a second conductive surface, a first wire bond from said first ball bond to said first conductive bump, a second conductive bump on a third surface, a second ball bond on said second conductive surface.” None of these limitations are taught or suggested by Nagaoka, nor does the Office Action attempt to explain to the contrary. For at least these reasons, claim 50 and claims 51-57 dependent therefrom are allowable over Nagaoka.

Claims 1-4, 7, 8, 10-17, 24-27, 31-33 and 42-57 stand rejected under 35 U.S.C. 102 as being anticipated by Yin et al., Publication No. US 2003/0049882 (hereinafter “Yin”). Reconsideration is respectfully requested.

As discussed above, amended claim 1 recites a “bump ... at one end of each of said first and second wire bonds.” To the contrary, Yin teaches only one bump 56, formed on component 30, under one of the two wire bonds. For at least this reason, claim 1 and claims 2-4, 7, 8 and 10-13 dependent therefrom are allowable over Yin.

Claim 14 recites a “first wire bond ... [and] a second wire bond ... electrically connected to said first wire bond; and wherein said first wire bond and said second wire bond are configured such that an imaginary line drawn between endpoints of said first wire bond and an imaginary line drawn between endpoints of said second wire bond are not parallel.” The Office Action points toward Figure 3 in an attempt to meet this limitation. In Figure 3, however, none of the wire bonds are electrically connected to one another, as

recited in claim 14. For at least this reason, claim 14 and claims 15-17 dependent therefrom should be allowed over Yin.

Amended claim 24 recites a “method of wire bonding ... comprising: forming a first wire bond between first and second components; ... and connecting said first wire bond on at least one end using a ball bond on top of a first conductive bump.” Yin fails to teach or suggest this limitation. Yin discloses one bump 56, and wire bond 76 is connected to bump 56 via a stitch bond 74. See Figure 6 and accompanying text. For at least this reason, claim 24, and claims 25-27 and 31-33 dependent from claim 24, are allowable over Yin.

Claim 42 recites a device that “forms a first wire bond ... [and] a second wire bond ... wherein said first and second wire bonds are electrically connected on said second surface, and wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane.” As discussed above in connection with claim 14, Yin does not teach or suggest this limitation. For at least this reason, claim 42 and claims 43-49 dependent therefrom are allowable over Yin.

Claim 50 recites a controlled device that forms a “first conductive bump on a first conductive surface, ... [and] a second conductive bump on a third surface, a second ball bond on said second conductive surface.” As discussed above in connection with claim 1, Yin teaches only one bump 56, formed on component 30, under one of the two wire bonds. For at least this reason claim 50 and claims 51-57 dependent therefrom are allowable over Yin.

Claims 40, 41, 45, 46 and 50-57 stand rejected under 35 U.S.C. 103 as being unpatentable over Chen in view of Hortaleza et al., U.S. Patent No. 6,131,792 (hereinafter “Hortaleza”). This rejection is respectfully traversed for the following reasons.

Initially, Applicants do not agree with the Examiner that the references are properly combinable under 35 U.S.C. 103, because there is no motivation to combine the references to arrive at the claimed invention.

Further, claims 40 and 41 depend from claim 34. As discussed above, Chen fails to teach or suggest “forming a first conductive bump on a first surface; [and] ... forming a first wire bond ... to said first conductive bump; forming a second conductive bump on a third surface; [and] ... forming a second wire bond ... to said second conductive bump,” as recited in claim 34. Hortaleza adds nothing to Chen to remedy this deficiency. Claims 40 and 41 depend from claim 34 and contain every limitation of claim 34, and are allowable over the proposed combination for at least the reasons for allowance of claim 34.

Claims 45 and 46 depend from claim 42. As discussed above, claim 42 recites that the “second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane,” and Chen fails to teach or suggest this limitation. Hortaleza adds nothing to Chen to remedy this deficiency. Claims 45 and 46 contain every limitation of claim 42, and are allowable over the asserted combination for at least the reasons for allowance of claim 42.

Claim 50 recites a device that forms a “first conductive bump on a first conductive surface, ... [and] a second conductive bump on a third surface.” As discussed with respect to claim 1, Chen fails to teach or suggest this limitation, and Hortaleza adds nothing to Chen to remedy this deficiency. Claim 50, and claims 51-57 dependent therefrom are allowable over the asserted combination for at least this reason.

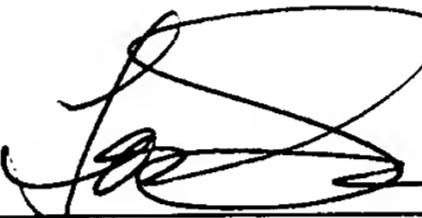
Application No.: 10/002,175

Docket No.: M4065.0493/P493

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. According, the Examiner is respectfully requested to pass this application to issue.

Dated: October 2, 2003

Respectfully submitted,

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